WHAT IS CLAIMED IS:

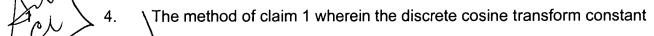
1. A method for generating faster discrete cosine transforms, comprising:

arranging discrete cosine transform equations into at least one collection having at least/two discrete cosine transform constants;

scaling the discrete cosine transform equations in the at least one collection by dividing each of the discrete cosine transform constants in the collection by one of the discrete cosine transform constants from the at least one collection; and representing each of the scaled discrete cosine transform constants with estimated scaled discrete cosine transform constants approximated by sums of powers-of-2.

2. The method of claim 1 further comprising separating an image into at least one block and transforming the block into transformed data by performing matrix multiplication on the discrete cosine transform equations based upon binary arithmetic using the estimated scaled discrete cosine transform constants and performing linear shifts and additions.

3. The method of claim 1 wherein the scaling the discrete cosine transform equations in the at least one collection by dividing each of the discrete cosine transform constants in the at least one collection by one of the discrete cosine transform constants from the at least one collection saves multiplications.



- 2 /chosen for scaling the discrete cosine transform equations in the at least one
- 3 collection is selected according to a predetermined cost function.
- 1 5. The method of claim 4 wherein the cost function minimizes a number
- 2 of add operations.
- 1 6. The method of claim 4 wherein the cost function minimizes a worst
- 2 case number of add operations
- 1 7. The method of claim 4 wherein the cost function minimizes an error per
- 2 constant resulting from the approximations.
- 1 8. The method of claim 2 wherein the transforming the block into
- 2 transformed data further comprises using all least one set of one dimensional
- 3 discrete cosine transform equations.
- 1 9. The method of claim 8 wherein the discrete cosine transform constants
- 2 are obtained by splitting the discrete cosine transform constants into even and odd
- 3 terms by obtaining sums and differences of input samples.
- 1 10. The method of claim 2 wherein the block is an N₁xN₂ block.
- 1 11. The method of claim 10 wherein $N_1 = N_2 = 8$.



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a discrete cosine transformer for applying a discrete cosine transform to decorrelate data into discrete cosine transform equations, the discrete cosine transform equations having been formed by arranging the discrete cosine transform equations into at least one collection having at least two discrete cosine transform constants, scaling the discrete cosine transform equations in the at least one collection by dividing each of the discrete cosine transform constant in the collection by one of the discrete cosine transform constants from the at least one collection and representing each of the scaled discrete cosine transform constants with estimated scaled

1 13. The data compression system of claim 12 further comprising a quantizer for quantizing the transformed data into quantized data to reduce the number of bits needed to represent the transform coefficients.

discrete cosine transform constants approximated by sums of powers-of-\(\frac{1}{2}\).

14. The data compression system of claim 12 wherein the discrete cosine transformer further separates an image into at least one block and transforms the block into transformed data using the discrete cosine transform equations based upon binary arithmetic using the estimated scaled discrete cosine transform constants and performing linear shifts and additions.

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The data compression system of claim 12 wherein the transformer executes eduations that save multiplication operations, the equations having been 3 formed by scaling the discrete cosine transform equations in the at least one collection by dividing each of the discrete cosine transform constants in the at least 4 one collection by one of the discrete cosine transform constants from the at least 5 6 one collection.

- 1 16. The data compression system of claim 15 further comprising an 2 entropy encoder for further compressing the quantized coefficients losslessly.
- 17. The data compression system of claim 12 wherein the discrete cosine transform constant used for scaling the discrete cosine transform equations in the at 2 least one collection is selected according to a predetermined cost function. 3
 - The data compression system of claim 17 wherein the cost function 18. minimizes a number of add operations.
- 19. The data compression system of claim 17 wherein the cost function 1 2 minimizes a worst case number of add operations.
- 1 20. The data compression system of claim 17 wherein the cost function 2 minimizes an error per constant resulting from the approximations.
 - The data compression system of claim 12 wherein discrete cosine 21. transformer uses at least one set of one dimensional discrete cosine transform equations.

Page 26 LD9-2000-0056US1 G 501.376US01 tent Application



- 22. The data compression system of claim 22 wherein the equations split
- the discrete cosine transform coefficients into even and odd terms by obtaining sums
- 3 and differences of input samples.
- 1 23. The data compression system of claim 14 wherein the block is an
- 2 N₁xN₂ block.
- 1 24. The data compression system of claim 23 wherein $N_1 = N_2 = 8$.

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| 25. | Δ | printer, | compri | RIDA |
| Z U . | 7/1 | printer, | COMP | yıı ıg |

a memory for storing data;

a processor for processing the data to provide a compressed print stream

output; and

a printhead driving circuit for controlling a printhead to generate a printout of the data;

wherein the processor applies a discrete cosine transform to decorrelate data into transform coefficients using discrete cosine equations, the discrete cosine transform equations having been formed by arranging the discrete cosine transform equations into at least one collection having at least two discrete cosine transform constants, scaling the discrete cosine transform equations in the at least one collection by dividing each of the discrete cosine transform constant in the collection by one of the discrete cosine transform constants from the at least one collection and representing each of the scaled discrete cosine transform constants with estimated scaled discrete cosine transform constants approximated by sums of powers-of-2.

26. The printer of claim 25 wherein the processor further separates an image into at least one block and transforms the block into transformed data by performing matrix multiplication on the discrete cosine transform equations based upon binary arithmetic using the estimated scaled discrete cosine transform constants and performing linear shifts and additions.

Page 28 BLD9-2000-0056US1 G 501.376US01 atent Application

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- 27. The printer of claim 25 wherein the processor executes equations that 2 save multiplication operations, the equations having been formed by scaling the
 - 3 discrete cosine\transform equations in a collection by dividing each of the discrete
 - 4 cosine transform constants in the at least one collection by one of the discrete
 - 5 cosine transform constants from the at least one collection.

is selected according to a predetermined cost function.

- 1 28. The printer of claim 25 wherein the discrete cosine transform constant 2 used in scaling the discrete cosine transform equations in the at least one collection
- 1 29. The printer of claim 28 wherein the cost function minimizes a number 2 of add operations.
- 1 30. The printer of claim 28 wherein the cost function minimizes a worst 2 case number of add operations.
 - 31. The printer of claim 28 wherein the cost function minimizes an error per constant resulting from the approximations.
- 1 32. The printer of claim 25 wherein processor uses at least one set of one dimensional discrete cosine transform equations.
- 1 33. The printer of claim 32 wherein the processor splits the discrete cosine 2 transform coefficients into even and odd terms by obtaining sums and differences of 3 input samples.



34. The printer of claim 26 wherein the block is an N₁xN₂ block.

35. The printer of claim 34 wherein $N_1 = N_2 = 8$.

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36. An article of manufacture comprising a program storage medium readable by a computer, the medium tangibly embodying one or more programs of instructions executable by the computer to use equations created by a method for generating faster discrete cosine transforms, the method comprising:

arranging discrete cosine transform equations into at least one collection having at least two discrete cosine transform constants;

scaling the discrete cosine transform equations in the at least one collection by dividing each of the discrete cosine transform constant in the collection by one of the discrete cosine transform constants from the at least one collection; and representing each of the scaled discrete cosine transform constants with estimated scaled discrete cosine transform constants approximated by sums of

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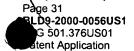
37. The article of manufacture of claim 36 further comprising separating an image into at least one block and transforming the block into transformed data by using discrete cosine transform equations based upon binary arithmetic using the estimated scaled discrete cosine transform constants and performing linear shifts

5 and additions.

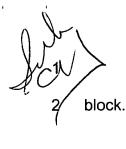
power\$-of-2.



- 38. \ The article of manufacture of claim 36 wherein the scaling the discrete
- /2 /cosine transform equations in the at least one collection by dividing each of the
- 3 discrete cosine transform constants in the at least one collection by one of the
- 4 discrete cosine transform constants from the at least one collection saves
- 5 multiplications.
- 1 39. The article of manufacture of claim 36 wherein the discrete cosine
- 2 transform constant chosen for scaling the discrete cosine transform equations in the
- 3 at least one collection is selected according to a predetermined cost function.
- 1 40. The article of manufacture of claim 39 wherein the cost function
- 2 minimizes a number of add operations.
- 1 41. The article of manufacture of claim 39 wherein the cost function
- 2 minimizes a worst case number of add operations.
- 1 42. The article of manufacture of claim 39 wherein the cost function
- 2 minimizes an error per constant resulting from the approximations.
- 1 43. The article of manufacture of claim 36 wherein the transforming the
- 2 block into transformed data further comprises using at least one set of one
- 3 dimensional discrete cosine transform equations.
- 1 44. The article of manufacture of claim 43 wherein the discrete cosine
- 2 transform constants are obtained by splitting the discrete cosine transform constants
- 3 into even and odd terms by obtaining sums and differences of input samples.







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45. The article of manufacture of claim 37 wherein the block is an N₁xN₂

46. The article of manufacture of claim 45 wherein $N_1 = N_2 = 8$.

47. A data analysis system, comprising;

a memory for storing discrete cosine transform equations having been are formed by arranging the discrete cosine transform equations into at least one collection having at least two discrete cosine transform constants, scaling the discrete cosine transform equations in the at least one collection by dividing each of the discrete cosine transform constant in the collection by one of the discrete cosine transform constants from the at least one collection and representing each of the scaled discrete cosine transform constants with estimated scaled discrete cosine transform constants approximated by sums of powers-of-2; and

a transformer for applying the transform equations to perform a discrete cosine transform to decorrelate data into discrete cosine transform coefficients.

48. The data analysis system of claim 47 wherein the transformer further separates an image into at least one block and transforms the block into transformed

- data by using the discrete cosine transform equations based upon binary arithmetic
- 4 using the estimated scaled discrete cosine transform constants and performing
- 5 linear shifts and additions.

> 49. The data analysis system of claim 47 wherein the discrete cosine

transform constant used for scaling the discrete cosine transform equations in the at

3 least one collection is selected according to a predetermined cost function.